Certificate of Mailing

I hereby certify that this Petition to Revive an Abandoned Application under 37 U.S.C. §1.137 (b), Continuation Application, and Preliminary Amendment are being deposited with the United States Postal Service on June 24, 2003 with sufficient postage as first class mail in an envelope addressed to Mail Stop Petition, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Jean-Claude Roze et al.

Former Serial No.:	09/806,864	Former Examiner:	K. Kerns
Filed:	Unknown	Former Art Unit:	1725
Docket No.:	Case 5596 A		

Title: POLYURETHANE BASED BINDER SYSTEM FOR THE MANUFACTURE OF FOUNDRY CORES AND MOLDS

PRELIMINARY AMENDMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This preliminary amendment is enclosed with the continuation application filed in connection with application serial number 09/806,864 filed on July 9, 2001. Although it is not believed any fees are due in connection with this amendment, the Commissioner is authorized to charge deposit account #01-2530 for any additional fees due.

IN THE SPECIFICATION

Page 1 of specification, after title:

CLAIM TO PRIORITY

This application is a continuation application of U.S. application serial number 9/806,864 filed on July 9, 2001. [Applicant's] Applicants claim priority to PCT/EP99/08419 filed on November 4, 1999, [and] DE 198 50 833 filed on November 4, 1998, U.S. application serial number 9/806,864 filed on July 9, 2001.

Page 9, line 28 of the specification

Delete "$(R'\text{-}O)_3\text{-}Si$" and insert therefor --$(R'\text{-}O)_3\text{-}Si\text{-}R$--.

Abstract:

Delete abstract and place the following on a separate page at the end of the application:

ABSTRACT

A cold-box process for preparing a foundry shape, e.g. mold or core, that uses a binder comprising a phenolic resin component and an isocyanate component, wherein the phenolic resin component comprises (a) an alkoxy-modified phenolic resole resin and (b) an oxygen-rich polar, organic solvent component, which contains a fatty acid ester.

IN THE CLAIMS

1-9 (canceled)

10. (currently amended) A process for preparing a foundry shape by the cold-box process which comprises:

(a) forming a foundry mix ~~as set forth in claim 8~~ comprising a major amount of aggregate and an effectively binding amount of a binder system comprising:

(i) a phenolic resole resin component, and

(ii) an isocyanate component,

wherein the phenolic resin component comprises (a) an alkoxy-modified phenolic resole resin component such that the mole ratio of alcohol to phenol used to prepare said alkoxy-modified phenolic resole resin is less than 0.25:1.0, and (b) at least one oxygen-rich, polar organic solvent component, wherein the solvent portion of the phenolic resin component of the binder system amounts to no more than 40 % by weight based upon the weight of the phenolic resin component and the amount of oxygen-rich polar organic solvent is at least 50 weight percent based on the total weight of the solvent in the phenolic resin component;

and wherein either the phenolic resin component, isocyanate component, or both of said components contain a fatty acid ester having from 1 to 12 carbon atoms in the alcohol chain of the fatty acid ester;

(b) forming a foundry shape by introducing the foundry mix obtained from step (a) into a pattern;

(c) contacting foundry shape mix with a volatile tertiary amine catalyst; and

(d) removing the foundry shape of step (c) from the pattern.

11-15 (canceled)

16. (new) The process of claim 10 wherein the oxygen-rich polar, organic solvent is selected from the group consisting of glycol ether esters, glycol diesters, glycol diethers, cyclic ketones, cyclic esters, cyclic carbonate, and mixtures thereof.

17. (new) The process of claim 16 wherein the fatty acid ester is part of the phenolic resin component and is derived from an alcohol having from 4 to 10 carbon atoms.

18. (new) The process of claim 18 wherein the fatty acid ester is the butyl ester of tall oil fatty acids.

19. (new) The process of claim 19 wherein the amount of said binder in said foundry mix is about 0.6 percent to about 5.0 percent based upon the weight of the aggregate.

The Invention

The invention relates to a process for preparing a foundry shape by the cold-box process with a phenolic urethane binder. The claims, as amended, indicate that the novel aspect of the process is that the phenolic resin component of the phenolic urethane binder used in the process comprises a phenolic resin component wherein the phenolic resin component comprises (a) an alkoxy-modified phenolic resole resin such that the mole ratio of alcohol to phenol used to prepare said alkoxy-modified phenolic resole resin is less than 0.25:1.0, and (b) at least one oxygen-rich, polar organic solvent, wherein the solvent portion of the phenolic resin component of the binder system amounts to no more than 40 % by weight based upon the weight of the phenolic resin component, and the amount of oxygen-rich polar organic solvent is at least 50 weight percent based on the total weight of the solvent in the phenolic resin component, and that the phenolic resin component, the isocyanate component of the binder, or both of these components of the binder, contain a fatty acid ester.

The use of defined phenolic urethane binder in the process provides advantages because less solvent can be used in the phenolic resin component and the majority of the solvents used are organic compounds that are not highly volatile. This is in contrast to phenolic urethane cold-box foundry binders typically used, which contain more solvent and require greater amounts of highly volatile aromatic solvents in the phenolic resin component of the phenolic urethane binder. Thus, cores and molds can be produced by the process that generate less smoke during the casting process.

The addition of the fatty acid ester to the binder results in improved release of the foundry shapes (typically cores or molds) from the pattern after curing the foundry shapes.

These results are achieved without detrimentally affecting the cure speed of the binder. As the data in Table IV of the specification (page 14) indicate, the cure speed of the binder is not adversely affected, and in some cases, is improved if a binder within the scope of the invention is

used. The cure speed is reflected by the increase in immediate tensile strengths of the test cores made with the binder. The discovery that the cure speed of these binders is not adversely affected, and in some cases is improved, is unexpected, because the data in Table IV show that that the addition of a fatty acid ester lowers the immediate strength of foundry shapes, made with a binder that is based upon a phenolic resole resin that is not alkoxy-modified, and the prior art indicates that binders made with alkoxy-modified resins produce foundry shapes with decreased immediate tensile strengths.

DISCUSSION OF EXAMINER'S OFFICE ACTION

The Examiner refused to consider Applicants' last amendment because it raised new issues and required a new search. However, in order to expedite examination of this continuation application, Applicants have decided to respond to the issues raised in the Examiner's last Office Action.

Specification

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Applicants' response

Applicant has indicated that the abstract should be placed on a separate page.

Claim Rejections - 35 USC § 103 (a)

The following is a quotation of 35 U.S.C. §103(a), which forms the basis for all obviousness rejections Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10,16,18-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laitar et al. (US 4,546,124) in view of Dando et al. (WO 98/02473).

Laitar et al. disclose polyurethane binder compositions for producing foundry aggregate cores and molds, in which the binder is prepared by forming a foundry mix of the following components with foundry sand: a phenolic resin component that includes an alkoxy modified phenolic resole resin, an isocyanate component, and an oxygen-rich, polar organic solvent (ranging from 5% to 70% by weight of the component) that includes organic esters made from alcohols containing 1 to 8 carbon atoms (abstract; column 1, lines 5-13; column 2, lines 8-48; column 3, lines 63-68; column 4, lines 1-4 and 15-34; and column 5, lines 6-25). The composition is then placed in a core box or pattern and contacted with a tertiary amine catalyst to form a shaped product, in which one of ordinary skill in the art would subsequently remove the shaped product from the pattern for further use in other foundry processes (abstract; column 1, lines 5-13; column 2, lines 8-48; column 5, lines 57-64; column 7, lines 31-42; and column 8, lines 4-22), The binder is present in the moldable composition in a range of from about 0.7% to 6% by weight of the composition (column 7, lines 1-4).The alcohol used to prepare the alkoxy modified phenolic resole resins have at least about 25% mole % of alcohol (hydroxy groups) per mole of phenol (column 3, lines 63-68; and column 4, lines 1-14). One of ordinary skill in the art would have recognized that the 25% mole ratio of alcohol to phenol used to prepare the alkoxy modified phenolic resole resin, although it is the minimum value disclosed by Laitar et al., includes unreacted portions within the mixture, such that less than 25% mole ratio of the reacted portions would be present in at least the early stages of the process Laitar et al. do not specifically teach any of the group of esters, diesters, diethers, ketones, cyclic carbonate, or mixtures thereof, as well as the solvent portion of the phenolic resin component of the binder system being no more than 40% by weight of the phenolic resin component.

However, Dando et al. disclose benzylic ether phenolic resole resins for use as binders for foundry cores and molds made by the cold-box process, in which the foundry binder components include phenolic resole resins and a polar orqanic solvent, in which cyclic esters (fatty acid ester including dimethyl glutarate) are selected (abstract; page 1, lines 5-14; and page 13, lines 10-23). The organic solvent portion within the phenolic resole resin component is preferably within the 40% to 60% (by weight) range, including aromatic solvents, esters, ethers, alcohols, or mixtures of these solvents (page 11, lines 28-32; page 12, lines 1-3; page 13, lines 4-9). Selection of these organic compounds within the appropriate ranges are advantageous for only being slightly polar such that it is not incompatible with the aromatic solvent, to achieve complete reaction and curing of the binder compositions (page 13, lines 4-23). It would have been obvious to one of ordinary skill in the art at the time the applicants' invention was made to modify the selection of polar organic solvents and weight ratio of the organic solvent portion disclosed by Laitar et al., by using the (slightly polar) cyclic esters taught by Dando et al. and using an organic solvent portion within the phenolic resole resin component at or near 40% by weight, in order to achieve compatibility with the aromatic solvent and obtain complete reaction and curing of the binder compositions (Dando et al.; page 13, lines 4-23).

Applicants' response

The claims were amended to indicate that the binder must contain at least one oxygen-rich, polar organic solvent comprising a fatty acid ester containing from 1 to 12 carbon atoms in the alcohol chain of the fatty acid ester. This feature of the invention, in combination with the other elements of the claimed is invention, is not taught or suggested by Laitar or Dando.

The use of the fatty acid ester in the process is significant. The fatty acid ester is not an aromatic solvent. The addition of the fatty acid ester to the binder improves the release of the foundry shape from the pattern after the foundry shape is cured. This result is achieved without creating additional volatile organic hydrocarbon wastes or smoke when metal parts are cast.

Furthermore, as the data in Table IV of the specification (page 14) indicate, the cure speed of the binder is not adversely affected by the addition of the ester of the fatty acid, and in some cases is improved. The cure speed is reflected by the immediate tensile strengths, which are shown in Table IV of the application.

Tests 4-7, the results of which are set forth in Table IV, indicate that the addition of a fatty acid ester results in no change, or an increase, in the immediate tensile strengths of cores made with binders based upon a phenolic resole resin that is alkoxy-modified. Test cores 4-6, which were made with binders based upon phenolic resole resin component that contained a fatty acid ester, had immediate tensile strengths of 205, 235, and 225 respectively. On the other hand, test core 7, which was made with a binder based upon phenolic resole resin component that did not contain a fatty acid ester, had an immediate tensile strength of 205.

This result is unexpected for two reasons:

1. Tests 1-3, disclosed at page 14 of the application, were made with a binder based upon a phenolic resole resin that was not alkoxy-modified. Tests 1-3 indicate that

the addition of a fatty acid ester reduces the immediate tensile strengths of cores made with binders based upon a phenolic resole resin that is not alkoxy-modified. Test cores 1 and 2, which were made with binders based upon phenolic resole resin component that contained a fatty acid ester, had immediate tensile strengths of 105 and 120 respectively. On the other hand, test core 3, which was made with a binder based upon phenolic resole resin component that did not contain a fatty acid ester, had an immediate tensile strength of 140.

2. The Laitar patent, cited by the Examiner, indicates that the using an alkoxy-modified resin, instead of one that is not alkoxy-modified, reduces the immediate tensile strengths of foundry shapes. Table II at column 10 of the Laitar patent indicates that the immediate tensile strength of a core made with alkoxy-modified resin was 122, while the core made with a commercial binder, that was not alkoxy-modified, was 137.

In view of (1) and (2), it is unexpected that Applicants' process, which uses a binder that contains an ester of a fatty acid, can be used for making foundry shapes that release from the pattern after curing, results in less volatile organic hydrocarbon wastes during casting, and results in less smoke during casting, without detrimentally affecting the cure speed of the binder.

CONCLUSION

In view of the differences between Applicants' invention and the prior art, Applicants submit that the claims, as amended, are not obvious. Furthermore, Applicants submit that their invention could only be derived from the references by the use of "hindsight", i.e. by knowing what Applicants' invention was in advance from Applicants' disclosure, and then *ex post facto* reconstructing Applicants' invention from the prior art after a thorough search. The discussion in *In re Kotzab*, 55 U.S.P.Q. 2d 1313 (Fed. Cir. 2000) at page 1317 is relevant to this point:

> A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See *Dembiczak*, 175 F.3d at 999, 50 USPQ2d at 1617. Close adherence to this methodology is especially important in cases where the very ease with which the invention can be understood may prompt one "to fall victim to the insidious effect of a hindsight syndrome wherein that which only the invention taught is used against its teacher.[1] *Id.* (quoting *W.L. Gore & Assocs., Inc, v Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303,313 (Fed. Cir. 1983).

The prior art does not lead one of ordinary skill in the art to Applicants' process as defined by the limitations in the claims. The binder used in Applicants' process contains a phenolic resin component that comprises (a) an alkoxy-modified phenolic resole resin component such that the mole ratio of alcohol to phenol used to prepare said alkoxy-modified phenolic resole resin is less than 0.25:1.0, and (b) at least one oxygen-rich, polar organic solvent component, wherein the solvent portion of the phenolic resin component of the binder system amounts to no more than 40% by weight based upon the weight of the phenolic resin component and the amount of oxygen-rich polar organic solvent is at least 50 weight percent based on the total weight of the solvent in the phenolic resin component. The binder must also contain contain a fatty acid ester having from 1 to 12 carbon atoms in the alcohol chain of the fatty acid ester. Applicants submit that this process, as defined by the claims, and the advantages that result, could have only been derived by hindsight.

[1] Underlining added for emphasis.

Applicants submit that the application is now in condition for allowance and respectfully request a notice to this effect. If the Examiner believes further explanation of Applicants' position is needed, Applicants' attorney will discuss this matter over the telephone or visit the Examiner personally if this may be useful.

Respectfully submitted,

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